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**(54) ETCHING METHOD**

(57) Abstract:

**PURPOSE:** To accurately miniaturize by mounting an etching mask on a substrate, supplying etching reaction gas, and irradiating the surface of the substrate with soft X-rays or vacuum ultraviolet rays, thereby etching the irradiated part of the substrate.

**CONSTITUTION:** An optical system 3 for introducing a radiated light L of soft X-rays or vacuum ultraviolet rays from an electron synchrotron light radiating device 1 into a reaction chamber 4 is composed of two planar reflection mirrors 3A, 3B. The material of a substrate 6 to be etched with the light L is made of SiO<sub>2</sub>, Si<sub>3</sub>N<sub>4</sub> or polysilicon added in high concentration with phosphorus or boron. Etching reaction gas G includes small amount of oxygen to be added fluorine and chlorine series etching gas such as SF<sub>6</sub>, CF<sub>4</sub>, SiF<sub>4</sub>, CCl<sub>4</sub>, Cl<sub>2</sub>, XeF<sub>2</sub>, etc. Thus, since the etching for a thin filmlike etching mask 7 made of a material of semiconductor of Si, Ge or metal and their polycrystal scarcely advances even under the irradiation of reaction gas, microminiaturization of 0.1 μm or less can be performed.

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